



FIT TO THINK: CONCEPTUAL, CRITICAL & CREATIVE THINKING

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29 July 2004**



Why This is Important

- Even in combat, how well you think is more important to how well you fight than how physically fit you are
- A wrong decision, an unasked question, a forgotten task, an incomplete analysis, or a poor synthesis can kill you
- You must exert mental sweat as well as physical sweat to be “Fit to Fight”
- Good decisions require good thinking!



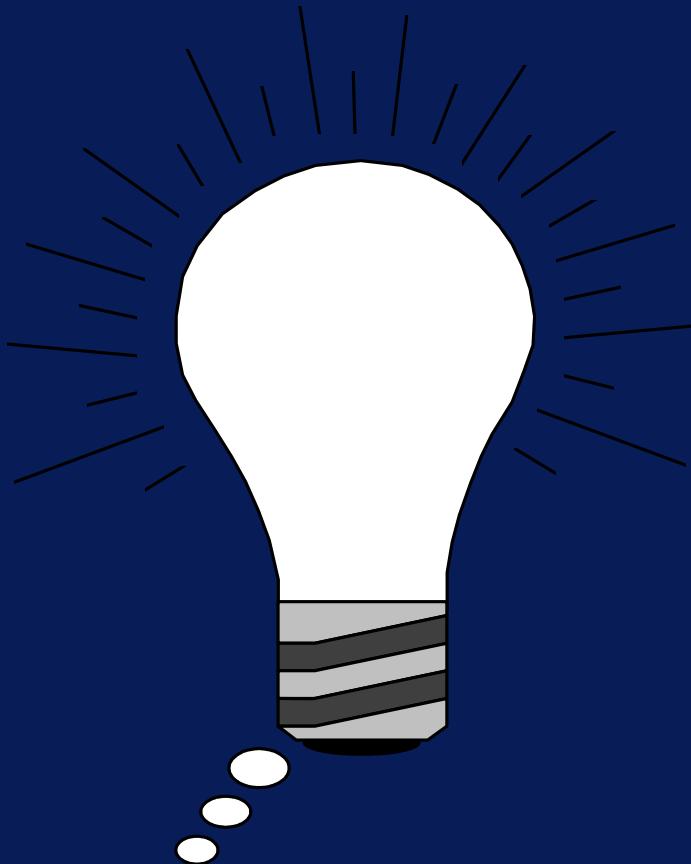
To Think

- To form or conceive in the mind
- To meditate, ponder, analyze or examine
- To have in mind as a plan, intent, or purpose; intend
- To hold as an opinion; believe; suppose
- To reflect upon the matter in question
- To anticipate or expect
- To make a mental discovery



Idea

- any conception existing in the mind as a result of mental understanding, awareness or activity
- a thought, conception or notion
- an impression
- a plan of action; an intention





Why Do We Use A Light Bulb For An Idea?

- “Let there be light!”
- See where there was dark before
- Come to know and understand because we can see better...
- Who invented the light bulb?
- Thomas Alva Edison in 1879
- America’s most famous inventor
- Light bulb = invention = idea



Conceptual

- Pertaining to concepts or the forming of concepts
- CONCEPT--
 - a general notion or idea; conception
 - an idea of something formed by mentally combining all its characteristics or particulars: a construct
 - a directly conceived or intuited object



Why Conceptual Thinking Is Difficult

- We emphasize analysis
 - taking things apart
- Need to emphasize synthesis
 - putting things together
- Must think both ways
- Otherwise, we are “half wits”
- We don’t emphasize it, reinforce it, reward it and practice it



Utility and Value

- Concepts should be broad enough to be useful
- Concepts should be specific enough to be of value
- The “Goldilocks Problem”
- Like programming
- Able to be amended and modified
- Not limited by time and place



Example

- **Government is a concept**
- **It refers to a process, a means of decision making**
- **It is not bounded by time, size, place but links means and ends**
- **It is about both purposes and processes**
- **It permits comparison across cultures**
- **Focuses on how people make rules for living together**



Example

- Air Power is a concept
- What are the attributes of air power?
- How is it defined? Measured?
Assessed?
- There are different kinds of air power
 - Purpose Performance
 - Methods Munitions
 - Platforms Personnel
- Concepts can be used in myriad ways



Critical

- Inclined to find fault or judge with severity
- Occupied with or skilled in criticism
- Involving skilful judgment as to truth, merit. etc.
- Pertaining to or of the nature of crisis
- Involving grave uncertainty, risk, peril, etc.; dangerous



Critical Thinking Is . . .

- It is easy-almost natural—to criticize
- Others!
- We can all improve on someone else's ideas, behavior, performance, etc.
- Difficult--to do well and effectively
- To find root causes of why things are sub-par
- Perfection is elusive and there is always room for improvement



The Two Cultures

- You will be irritated with how critical civilian academics are
- Academics are by nature critical—they are educated by asking hard questions
- Those in the military are trained to be team players
- It is essential to mission effectiveness
- It will be a challenge for many of you to learn how to ask tough questions of yourself and others



Critical Thinking Is . . .

- Asking Why? Why not? How?
- Testing motives, bias, incompleteness
- Deals with alternative explanations
- Formulation and testing of hypotheses
- If ... then statements, and conditions
- Looking for mismatches
- Pattern recognition
- Analysis and synthesis



Good Critical Thinking

- Requires ability to assess premises of argument
- Premises state the assumptions of logic to follow
- They are the starting point of argumentation
- If the premises are faulty, then the argument is also
- Critical thinking begins with an assessment of the premises



Kinds of Bad Premises

- **Arguments are fallacious if they are based on the following:**
 - A. Unacceptable premises**
 - Shaky, dubious, inaccurate
 - B. Irrelevant premises**
 - No bearing on truth or conclusion
 - C. Insufficient premises**
 - Do not eliminate reasonable doubt



False Dilemma

- Either science can explain how a person was cured of a fatal disease or it was a miracle.
- Science can't explain how he was cured.
- Therefore it was a miracle.
- The two alternatives are not exhaustive
- Since there are other options, the argument is fallacious



Equivocation

- It is the duty of the press to publish news that's in the public interest.
- There is great public interest in UFOs.
- Therefore the press fails in its duty if it does not publish news about UFOs.
- “Public interest” = public welfare
- “Public interest” = what public is interested in
- Switched meaning invalidates argument



Composition

- Subatomic particles are lifeless.
- Therefore, anything made of them is lifeless.
- Whole may be greater than the sum of its parts.
- Emergent properties (water molecule and wetness) are important
- Fallacy is assuming that what is true of parts is true of whole.



Division

- We are alive.
- We are made of sub-atomic particles.
- Sub atomic particles are alive.
- The converse of the fallacy of composition
- What is true of the whole is not necessarily true of the parts.
- Components do not equal wholes.



Appeal to the Person

- You can't believe anything Smith says about the military.
- He's never been in the military.
- Anything he says about it is suspect.
- An argument should stand or fall on its merits, not who proposes it
- Crazy people can make rational statements & sane people non-sense
- You don't have to be a pig to be a pig farmer!



Genetic Fallacy

- The insight about how molecules arrange themselves came from a vision.
- A vision is not a scientific experiment.
- Therefore, the snake biting its tail arrangement for benzene molecules is erroneous.
- The origin of a claim is irrelevant to truth or falsity.
- Depends on evidence supporting it.



Appeal to Authority

- Linus Pauling won a Nobel Prize.
- Pauling says massive doses of vitamin C prevents colds, increases life expectancy.
- Therefore I should take lots of vitamin C.
- Appeal to celebrity or famous person is not a proof of contention or endorsement.
- May be true but the fact that he says so is irrelevant to proof.



Appeal to the Masses

- Everybody I know is taking money out of the stock market.
- Because they are doing it, I should too.
- Quantity of examples of a behavior is not necessarily proof, just popularity.
- (“100,000 lemmings can’t be wrong!)
- Popularity is not a reliable indicator of reality, truth or value.



Appeal to Tradition

- Astrology has been around for ages.
- Important people believed in its utility—
(Caesar, Hitler, the Reagans)
- Therefore, there must be something to it.
- Fact that an idea has been around for a long time does not mean it is true or that it should be continued.
- Slavery was a “tradition” before outlawed.



Appeal to Ignorance

- **Bigfoot must exist because nobody has been able to prove he doesn't.**
- **Inability to prove one thing does not mean opposite is true—both may be wrong.**
- **Assumes lack of evidence for one thing is good evidence for opposite proposition.**
- **Lack of evidence proves nothing—necessarily.**



Appeal to Fear

- If you do not convict this criminal, one of you may be the next victim.
- What defendant, even if guilty, has done in the past, is not proof of what he/she will do in future.
- What someone may do in future does not prove what they did in the past.
- Threats extort but don't necessarily promote truth.



Hasty Generalization

- I know a professor.
- He is more than a bit weird.
- Academics are oddballs and not to be trusted.
- Can't judge a class of people by observing only one—or many.
- Inference is legitimate only if the sample is representative of the class investigated.
- There are usually exceptions to generalizations.



Faulty Analogy

- Astronauts wear helmets and fly in spaceships.
- Figures in Mayan carvings seem to be wearing a helmet and flying in a spaceship.
- Therefore, it is a carving of an ancient astronaut.
- Carvings may bear greater resemblance to ceremonial headdress and fire.
- May make false connections in similarities/ dissimilarities.



Faulty Cause

- Night follows day.
- Therefore, day causes night.
- Because two events are constantly linked does not mean that one causes the other.
- When the US relies on airpower, wars are short.
- Therefore, the use of precise airpower causes short wars.
- May be other factors involved—causal connection assumed, not proven.



Argumentation

- The process of arriving at reasons and conclusions
- Involves marshaling evidence in support of valid statements built on sound premises
- Mark Twain's caution—the American predilection for confusing law courts and revival meetings



Objectivity

- **Object (n.)**—1. a material thing;
2. a purpose, end or goal
- **Object (v.)**—to be opposed; to feel or express disapproval
- **Objective**—independent of the mind; real
- **Objectivity**—state or quality of being objective (without bias or prejudice); objective reality



Creative

- Having the quality or power of creating
- Resulting from originality of thought, expression, etc.
- Originative, productive
- CREATE--
 - to evolve from one's own thought or imagination
 - to cause to happen; bring about; arrange as by intention or design



Thoughts On Creativity

- Creativity is a lot like golf and sex . . .
(doesn't have to be perfect to be worthwhile)
- Creativity is rare
- Creativity is non-linear, right brain
- Creativity is difficult
- Creativity breaks boundaries
- Creativity embraces novelty
- Creativity is play and improvisation
- Creativity emphasizes alternatives



On The Need For Creative Thinking

**“The most indispensable attribute of
the great captain is imagination.”**

**General of the Army
Douglas MacArthur
Letter to Liddell Hart, 1959**



Your Brain

Left

- **one thing at a time**
- **linear processing**
- **sequential operation**
- **writing & symbols**
- **analysis**
- **logic & reason**
- **mathematical**
- **verbal memory**

Right

- **integrating inputs**
- **holistic perception**
- **dreams**
- **holistic solutions**
- **synthesis**
- **pattern recognition**
- **intuition, insight**
- **visualizing**



Questions

- Questions precede answers
- Everything is an answer without a question
- Questions help discriminate among massive amounts of data
- The “need to know principle”
 - What do you need to know?
 - Why do you need to know it?



The Importance of Questions

- Comes from Latin *quaerere* (to ask, to seek)
- You are on a quest for meaning and understanding when you read
- If you don't know where you are going, it doesn't matter which road you take
- Know your direction if not your destination when you start your journey



Questions

- **Who, What, Where, When?
(Information)**
- **How and Why? (Analysis)**
- **The right questions and the right combination of questions**
- **The right sequence of questions**
- **The questions generated by your questions**
- **Ask “why” five times**



“Only Connect”

- To bind or fasten together; join or unite; link
- To establish communication between
- To have as an associated or accompanying feature
- CONNECTION--
association; relationship
affiliation, alliance, combination
junction, conjunction, union



Why Connections Are Vital

- **Patterns of thought**
 - deductive
 - inductive
- **Extend knowledge by linkages**
 - build bridges from what we do know to what we don't know
 - “from near to far”
- **Neural networks & synapses in our brain work in patterns of random connections**



Your Task

- **“Our challenge in this new century is a difficult one; to defend our nation against the unknown, the uncertain, the unseen and the unexpected.”**

Donald Rumsfeld, Secretary of Defense



Confronting The Future

- Must become comfortable with
 - the unknown
 - the unknown unknowns
 - the unknowable
- Embrace ambiguity
- Begin by asking good questions
- Accept the tentative, hypothetical
- Relish novelty, the mismatches
- Enjoy the process



Analogy

- A partial similarity between like features of two things on which a comparison may be based
- A way of building connections and finding patterns of similarity
 - structures
 - functions
- Types of analogies: personal, direct, symbolic and fantasy



Analogy

- Personal--imagine you are a wall covering--
What fears do you have? What could hurt you?
- Development of fire retardant, non-toxic items
- Direct--George de Mestral & burrs--How do they cling to clothes, dogs?
- Make a great fastener--VELCRO!
- Symbolic--Snake swallowing its tail--Friederich von Kukule & benzene molecules
- Ring structure of aromatic compounds



Analogy

- Fantasy Analogies--You become maker of your own world
- Escape hide bound notions and limitations
 - Limited only by imagination & creativity
- Example--How could navy improve security, reduce costs and minimize risk to human life at sub bases?
- Train dolphins--cheap, non-human, better sonar detection, can communicate



Forced Associations

- A way of making connections among supposedly disparate items to see what one can learn about each of them and what new combinations may emerge
- Examples--
 - Animals and weapons systems—
- AFRL does this routinely—engineer the organic and make the organic engineered



Animals & Weapon Systems

- **Turtles--**
 - **Mobile, armored-TANKS**
- **Birds--**
 - **Flight gives height, range, responsiveness--PLANES**
- **Hummingbirds--**
 - **Can hover, move backward-- HELICOPTERS**
- **Bats--**
 - **“see” by sound in darkness--SONAR**

Answers

- **n.—Something said or written in response to a question; the solution to a problem**
- **vt.—to reply to; to respond to a signal; to fulfill satisfactorily**
- **vi.—to reply in words or by action; to react to a stimulus; to serve the purpose, be sufficient; satisfy in detail the question asked**
- **There are no answers without questions—make sure you know what the question is that the answer relates to**
- **Miscellaneous facts are NOT answers**



Thinking & Winning

■ **YOUR MIND IS YOUR MOST IMPORTANT WEAPON--**

- With a good one, other weapons are more useful, sometimes unnecessary**
- With a poor one, other weapons are useless to achieve victory**
- You must learn confront the unknown, the uncertain and the unknowable**
- Exercise your brain as well as your body**



The Bottom Line— Hammond's Laws

- You are only as good as your mind--it is your best weapon for survival
- Knowledge is a force multiplier and the key to successful adaptation
- Learning how to think quickly and well is more important than learning what to think—learn how to learn for yourself



POINT TO PONDER

**“When we fight the next war, I
hope we do it from the neck up
instead of from the neck
down.”**

Jimmy Doolittle



So . . .

- **This is no bull—it is central to your competence, regardless of your service, career field, assignment or mission**
- **You must PRACTICE good thinking skills—they don't happen by accident**
- **If you don't do it, it won't get done**
- **If not now, when? If not here where? If not you, who?**



BOOKS ON THINKING

- **Roger van Oech**
 - *A Kick in the Seat of the Pants*
 - *A Whack on the Side of the Head*
- **Michael Michalko, *Thinkertoys***
- **Michael J. Gelb, *How to Think Like Leonardo DaVinci***
- **David Hackett Fischer, *Historians' Fallacies***